

What is claimed is:

1. A heat-resistant DNA ligase, wherein said ligase has an activity that is not substantially decreased by heat treatment at 100°C for 1 hour.

2. The heat-resistant DNA ligase according to Claim 1, where said ligase further has properties comprising:

(a) an optimum activity at a temperature of 70°C or more;

(b) utilization of ATP or ADP as a cofactor; and

(c) utilization of  $Mg^{2+}$ ,  $Mn^{2+}$ ,  $Ca^{2+}$  or  $Co^{2+}$  as a cofactor.

3. The heat-resistant DNA ligase according to Claim 1

or 2, wherein said ligase is derived from *Aeropyrum pernix*.

4. A substantial pure polypeptide molecule comprising:

(a) a first polypeptide having the amino acid

sequence set forth in SEQ ID NO:2; or

(b) a second polypeptide having the amino acid

sequence set forth in SEQ ID NO:2, wherein said second

polypeptide has one or more amino acid deletions,

substitutions or additions, and further wherein said

second polypeptide has DNA ligase activity that is not

substantially decreased by heat treatment at 100°C for

1 hour.

5. An isolated polynucleotide molecule comprising;

(a) a first polynucleotide having the nucleotide sequence set forth in SEQ ID NO:1;

(b) a second polynucleotide that hybrids with a complement of the nucleotide sequence set forth in SEQ ID NO:1 under stringent conditions, wherein said second polynucleotide encodes a heat-resistant DNA ligase having activity that is not substantially decreased by heat treatment at 100°C for 1 hour;

(c) a third polynucleotide that encodes a polypeptide having at least about 90% sequence homology with the polypeptide set forth in SEQ ID NO:2, wherein the polypeptide encoded by said third polynucleotide is

a heat-resistant DNA ligase having activity that is not substantially decreased by heat treatment at 100°C for 1 hour; or

(d) a third polynucleotide encoding a polypeptide according to Claim 4.

6. A recombinant vector comprising a polynucleotide molecule according to Claim 5.

7. A host cell transformed with a recombinant vector according to Claim 6.

8. A method for producing a heat-resistant DNA ligase, comprising (a) culturing a host cell according to Claim 7 under conditions such that said host cell expresses said

heat-resistant DNA ligase, and (b) collecting the heat-resistant DNA ligase so expressed.

9. The substantial pure polypeptide molecule according to claim 4, wherein said second polypeptide has at least about 90% sequence homology with the amino acid sequence set forth in SEQ ID NO:2

10. An isolated polynucleotide molecule comprising the nucleotide sequence set forth in SEQ ID NO:1.

11. An isolated polynucleotide molecule that encodes the amino acid sequence set forth in SEQ ID NO:2.

12. A substantial pure polypeptide molecule comprising the amino acid sequence set forth in SEQ ID NO:2.